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EXAMINER	
ARCIERO, ADAM A	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
03/05/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/574,032	SHIMAMURA ET AL.	
	Examiner	Art Unit	
	ADAM A. ARCIERO	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16 and 20-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 20-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

LIQUID-TYPE FUEL CELL SYSTEM AND CONTROL CIRCUIT OF THE SAME

Examiner: Adam Arciero S.N. 10/574,032 Art Unit: 1795 February 24, 2009

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 16, 2009 has been entered. Claims 1-2, 6, 10-12 and 15-16 are amended. Claims 17-19 and 28-29 are canceled.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

3. The claim rejections under 35 U.S.C. 102(b) as anticipated by HONG et al. on claims 1-2, 5-6, 8-10, 12 and 14-15 are withdrawn, because claims 1-2, 10, 12 and 15 have been amended.

4. The claim rejections under 35 U.S.C. 102(b) as anticipated by KEHJA et al. on claims 17-19 are withdrawn, because claims 17-19 have been canceled.

5. The claim rejections under 35 U.S.C. 102(b) as anticipated by NAGASUBRAMANIAN et al. on claims 1-2, 4, 6, 8-10 and 13 are maintained.

As to Claims 1, 6 and 8, NAGASUBRAMANIAN et al. discloses a solid state lithium battery **12** which comprises an anode **14**, a composite solid electrolyte film **10** and a cathode **16** (col. 4, lines 50-61 and as shown in FIG. 7). The composite solid electrolyte film **10** comprises a polyelectrolyte such as polyethylene oxide (PEO), a lithium salt (LiI), and small sized, inorganic particles such as alumina (AL_2O_3), which is an inorganic oxide, (col. 4, line 62 to col. 5, line 12). All particles are individual particles. A uniform suspension of lithium iodide salt coated alumina particles is produced (electrolytes occupying at least some of the interstitial spaces) (col. 5, lines 52-55). NAGASUBRAMANIAN et al. further discloses wherein the LiI (salt), PEO, and alumina particles are mixed and the PEO is dissolved resulting in a uniform suspension of LiI coated alumina particles, which was cast into films and placed between the anode and cathode (col. 5, lines 35-63) (film is places directly on the anode or cathode so that the individual particles on the surface of said film are affixed to either said cathode/anode). NAGASUBRAMANIAN et al. does not expressly disclose wherein the individual insulating particles are affixed to one or both of the cathode and anode. However, it is the position of the Examiner that said particles are inherently affixed to one of the cathode or anode, given that the alumina particles are formed in a uniform suspension, where there will be a distribution of said individual alumina particles throughout the film, consisting of the surfaces touching said cathode and anode. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the

reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

As to Claim 2, NAGASUBRAMANIAN et al. discloses the battery according to claim 1, wherein the individual insulating particles (on the composite solid electrolyte film **10**) are placed between the cathode **16** and the anode **14** so that the facing sides of the cathode **16** and the anode **14** do not contact each other, as can be seen in Figure 7 below.

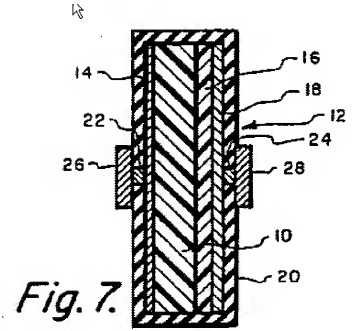


Fig. 7.

As to Claim 4, NAGASUBRAMANIAN et al. discloses the battery according to claim 1, wherein a composite solid electrolyte film was prepared with alumina with a particle size of 0.30 microns (col. 5, lines 35-46).

As to Claim 9, NAGASUBRAMANIAN et al. discloses the battery according to claim 1, wherein the cathode comprises a cathode active material which is formed using lithium transition

metal composite oxides and wherein the anode comprises an anode active material that is formed using lithium ions in carbon (col. 1, lines 54-57).

As to Claims 10 and 13, amounts of LiI, alumina (insulating particles) and PEO (electrolytic polymer) were separately weighed. LiI was dissolved in acetonitrile and the solution decanted. Alumina was then added to the solution and stirred. Isopropyl alcohol (IPA) was then added and stirred well. Acetonitrile was then added with some more IPA. PEO (electrolytic polymer) was slowly added while being stirred. A suspension was produced and the mixture was stirred over night to dissolve the PEO and was then cast into films (electrolyte layer) (col. 5, lines 35-55). This teaches that the insulating particles and electrolytic polymer were applied separately to form a composite solid electrolytic film. The alumina insulating particles inherently have spaces in between to hold the electrolytic polymer. The electrolyte layer is layered between a cathode and an anode, which are facing each other, as shown in FIG. 7 above.

Claim Rejections – 35 USC § 103

6. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over NAGASUBRAMANIAN et al. and SPEAKMAN on claims 11 and 20-23 are withdrawn, because claims 10-11 have been amended.

7. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HONG et al. and MUNSHI on claims 3 and 7 are withdrawn, because claim 1 has been amended.

8. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HONG et al. and NAGASUBRAMANIAN et al. on claims 4 and 13 are withdrawn, because claims 1 and 10 have been amended.

9. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HONG et al. and SPEAKMAN on claims 11 and 20-25 are withdrawn, because claims 10-11 have been amended.

10. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HONG et al. and TRIPLETT on claim 16 is withdrawn, because claim 16 has been amended.

11. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over HONG et al., TRIPLETT and SPEAKMAN on claims 26-27 is withdrawn, because claim 16 has been amended.

12. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over KEJHA et al. and SPEAKMAN on claims 28-29 are withdrawn, because claims 28-29 have been canceled.

13. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over NAGASUBRAMANIAN et al. as applied to claims 1-2, 4, 6, 8-10 and 13 above, and further in view of MUNSHI on claims 3 and 7 are maintained.

As to Claim 3, the disclosure of NAGASUBRAMANIAN et al. as discussed above is incorporated herein. NAGASUBRAMANIAN et al. does not expressly disclose the void ratio of the interstitial spaces to the individual insulating particles in the electrolyte layer.

However, MUNSHI teaches that in producing the polymer electrolyte film, after a mixture of a base polymer material with a lithium salt is dissolved in an organic solvent, the inorganic filler of silica or alumina is dispersed with a concentration in the range of 0.1-60% by volume of the final composition (col. 18, line 65-col. 19, line 5). A finely dispersed lithium ion conducting material is added in a concentration of about 0.1-80% by volume of the final composition (col. 19, lines 8-10). This concentration corresponds to the void ratio of the interstitial spaces to the insulating particles in the electrolyte layer claimed in claim 3. The void spaces created by the inorganic filler (insulating particles) is equal to the volume occupied the lithium ion conducting material so as to further increase the conductivity, as suggested by MUNSHI (col. 18, lines 30-31). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the amount of inorganic filler in the composite solid electrolyte film of NAGASUBRAMANIAN et al. so that a void ratio of 0.1-80% of the interstitial spaces to the insulating particles can be obtained so that the conductivity can be further increased, as taught by MUNSHI (col. 18, lines 30-31). Also, according to MPEP 2144.05 [R-5], the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists [*In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976)]. Also, according to MPEP 2144.05, "differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical". "Where the general

conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation," (*In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

As to Claim 7, the disclosure of NAGASUBRAMANIAN et al. as discussed above in claim 1 is incorporated herein. NAGASUBRAMANIAN et al. does not expressly disclose the battery according to claim 1 wherein the individual insulating particles comprise olefin resins.

However, MUNSHI teaches a state of the art lithium ion battery using a carbon electrode as the anode and a lithiated metal oxide as the cathode. A microporous separator of polypropylene or polyethylene (olefin resin) is used for separating the two electrodes, with an electrolyte comprised of a lithium salt and a liquid organic solvent usually absorbed into said separator (col. 1, lines 43-54). At the time of the invention, it would have been obvious to one of ordinary skill in the art to substitute a microporous separator comprising a polyolefin resin such as polyethylene, as taught by MUNSHI, for the composite solid electrolyte film comprising alumina as inorganic fillers of NAGASUBRAMANIAN et al., because polyethylene is well known for being a great insulator for the electrodes and absorber of electrolyte for lithium-ion batteries and the substitution of one known element (separator comprising an olefin resin) for another (separator comprising alumina) would have yielded the predictable results.

14. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over NAGASUBRAMANIAN et al. as applied to claims 1-2, 4, 6, 8-10 and 13 above, and further in view of HONG et al. on claims 5, 12 and 14-15 are maintained.

As to Claims 5 and 14, the disclosure of NAGASUBRAMANIAN et al. as discussed above in claims 1 and 10 is incorporated herein. NAGASUBRAMANIAN et al. does not expressly disclose the thickness of the electrolyte layer as being 10 microns or less.

However, HONG et al. discloses the thickness of the completed separation membrane polymer is created to be from 1-2 microns (pg. 17, lines 7-8). A roller having elastic rubber was used on the separation membrane comprising the polymer layer to improve the thick thickness problem (pg. 17, lines 6-10).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the method of making the composite solid electrolyte film of NAGASUBRAMANIAN et al. with the roller of HONG et al. so a desired thickness of 1-2 microns can be obtained, as suggested by HONG et al. (pg. 17, lines 6-10), so that a much thinner and lighter weight battery that takes up a smaller amount of space may be obtained.

As to Claim 12, NAGASUBRAMANIAN et al. does not expressly disclose the method of applying the individual insulating particles and electrolytic polymer simultaneously.

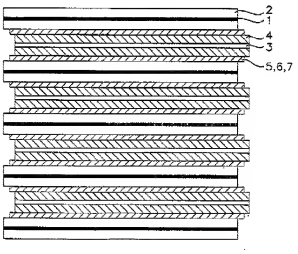
However, HONG et al. discloses an electrochemical cell comprising an anode and a cathode with a separation membrane installed between said anode and cathode (Abstract). The separation membrane was manufactured by apply the insulating particles (silica) and an electrolytic polymer (PVdF) simultaneously to form a polymer layer which was then compressed on the woven separation membrane (pg. 16-17, example 1) placed between said anode and cathode. At the time of the invention, a person having ordinary skill in the art would have found it obvious to have a mixture of the insulating particles and electrolytic layer applied

simultaneously instead of separately to achieve the same product, as suggested by HONG et al. (pg. 16 and 17, example 1) in order to increase production efficiency.

As to Claim 15, NAGASUBRAMANIAN et al. does not expressly disclose a battery assembly comprising multiple connected batteries.

However, HONG et al. discloses a stack of lithium secondary batteries in the form of a stacked mono cell including a separation membrane as discussed in claim 1 above. FIG. 4 (shown below) shows a cathode comprising a current collector **1** and a cathode active material **2** and an anode comprising a current collector **3** and an anode active material **4** which are attached together by a polymer binder **6** (pg. 16, lines 12-17). The polymer separation membrane (not labeled) is formed on the supporting body of the separation membrane (not labeled) is attached between the cathode and anode (pg. 16, lines 17-19).

FIG. 4



At the time of the invention, it would have been obvious to one of ordinary skill in the art to stack the battery arrangement of NAGASUBRAMANIAN et al. as taught by HONG et al. in

order to obtain a battery system which outputs more voltage depending on the voltage needs of the battery application.

15. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over NAGASUBRAMANIAN et al., HONG et al. as applied to claims 1-2, 4-6, 8-10,12-15 above, and further in view of and TRIPLETT on claim 16 is maintained.

As to Claim 16, the disclosure of the combination of NAGASUBRAMANIAN et al. and HONG et al. as discussed in claim 15 above is incorporated herein. The combination does not expressly disclose the battery assembly as being capable for powering a vehicle.

However, TRIPLETT teaches an electric vehicle driven by an electric motor which is powered by a DC battery having a plurality of cells (battery assembly) (Abstract).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the battery assembly of the combination of NAGASUBRAMANIAN et al. and HONG et al. into a vehicle to power said vehicle, as suggested by TRIPLETT (Abstract) because a battery is a clean power source instead of using an internal combustion engine.

16. Claims 11 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over NAGASUBRAMANIAN et al. (US Patent No. 5,599,355 A) as applied to claims 1-2, 6-7, 9-10 and 13 above, and further in view of HOLLAND et al. (US 4,765,864) as evidenced by SPEAKMAN (WO 99/19900 A2)..

As to Claim 11, NAGASUBRAMANIAN et al. does not expressly disclose wherein the electrolyte layer is formed by applying the constituents of the polypropylene and electrolytic polymer to the anode/cathode through a nozzle of an ink-jet printer.

However, HOLLAND et al. teaches forming an electrolytic medium by means of an ink-jet printing apparatus (col. 6, lines 8-26). At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the method of applying the electrolytic system of NAGASUBRAMANIAN et al. with an ink-jet printing method, because ink-jet printing enhances the ability of applying electrolytic polymers and provides directly written patterns onto a wide variety of surfaces, as evidenced by SPEAKMAN (pg. 22, lines 7-20).

As to Claims 20 and 22, NAGASUBRAMANIAN et al. does not expressly disclose an ink-jet printing method to produce an arranged pattern.

However, HOLLAND et al. teaches forming an electrolytic medium by means of an ink-jet printing apparatus (col. 6, lines 8-26). Ink-jet printing produces layers with directly written patterns, as evidenced by SPEAKMAN (pg. 22, lines 7-20). At the time of the invention, it would have been obvious to one of ordinary skill in the art to apply the electrolytic materials by means of ink-jet printing, because SPEAKMAN teaches that providing a directly written pattern enhances certain properties such as surface texture (pg. 7, lines 5-12).

As to Claims 21 and 23, the combination of NAGASUBRAMANIAN et al. and HOLLAND et al. as evidenced by SPEAKMAN does not expressly disclose the patterns claimed by the Applicant. However, the courts have held that the configuration of the pattern is a matter choice which a person of ordinary skill in the art would have found obvious absent persuasive

evidence that the particular configuration of the claimed patterns was significant, *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966), (MPEP 2144.01).

17. Claims 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over NAGASUBRAMANIAN et al. (US Patent No. 5,599,355 A) in view of HONG et al. (WO 03/065481 A) as applied to claims 1-2, 4-6, 8-10,12-15 above, and further in view of HOLLAND et al. (US 4,765,864) as evidenced by SPEAKMAN (WO 99/19900 A2).

As to Claim 24, NAGASUBRAMANIAN et al. and HONG et al. does not expressly disclose an ink-jet printing method to produce an arranged pattern.

However, HOLLAND et al. teaches forming an electrolytic medium by means of an ink-jet printing apparatus (col. 6, lines 8-26). Ink-jet printing produces layers with directly written patterns, as evidenced by SPEAKMAN (pg. 22, lines 7-20). At the time of the invention, it would have been obvious to one of ordinary skill in the art to apply the electrolytic materials by means of ink-jet printing, because SPEAKMAN teaches that providing a directly written pattern enhances certain properties such as surface texture (pg. 7, lines 5-12).

As to Claim 25, the combination of NAGASUBRAMANIAN et al., HONG et al. and HOLLAND et al. as evidenced by SPEAKMAN does not expressly disclose the patterns claimed by the Applicant. However, the courts have held that the configuration of the pattern is a matter choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed patterns was significant, *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966), (MPEP 2144.01).

18. Claims 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over NAGASUBRAMANIAN et al. (US Patent No. 5,599,355 A) in view of HONG et al. (WO 03/065481 A) and TRIPLETT (US Patent No. 3,566,985) as applied to claim 1-2, 4-6, 8-10,12-16 above, and further in view of HOLLAND et al. (US 4,765,864) as evidenced by SPEAKMAN (WO 99/19900 A2).

As to Claim 26, NAGASUBRAMANIAN et al., HONG et al. and TRIPLETT does not expressly disclose an ink-jet printing method to produce an arranged pattern.

However, HOLLAND et al. teaches forming an electrolytic medium by means of an ink-jet printing apparatus (col. 6, lines 8-26). Ink-jet printing produces layers with directly written patterns, as evidenced by SPEAKMAN (pg. 22, lines 7-20). At the time of the invention, it would have been obvious to one of ordinary skill in the art to apply the electrolytic materials by means of ink-jet printing, because SPEAKMAN teaches that providing a directly written pattern enhances certain properties such as surface texture (pg. 7, lines 5-12).

As to Claim 27, the combination of NAGASUBRAMANIAN et al., HONG et al., TRIPLETT and HOLLAND et al. as evidenced by SPEAKMAN does not expressly disclose the patterns claimed by the Applicant. However, the courts have held that the configuration of the pattern is a matter choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed patterns was significant, *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966), (MPEP 2144.01).

Response to Arguments

19. Applicant's arguments filed on December 15, 2008 have been fully considered but they are moot in view of new grounds of rejection as necessitated by Applicant's amendments..

Applicant's principal arguments are:

a) NAGASUBRAMANIAN et al. does not teach an electrolyte layer having individually affixed insulating particles directly formed on the anode or cathode (claim 1).

In response to Applicant's arguments, please consider the following comments.

a) NAGASUBRAMANIAN et al. teaches wherein the LiI (salt), PEO, and alumina particles are mixed and the PEO is dissolved resulting in a uniform suspension of LiI coated alumina particles, which was cast into films and placed between the anode and cathode (col. 5, lines 35-63) (film is places directly on the anode or cathode so that the individual particles on the surface of said film are affixed to either said cathode/anode).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ADAM A. ARCIERO whose telephone number is (571)270-5116. The examiner can normally be reached on Monday to Friday 8am to 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AA

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795